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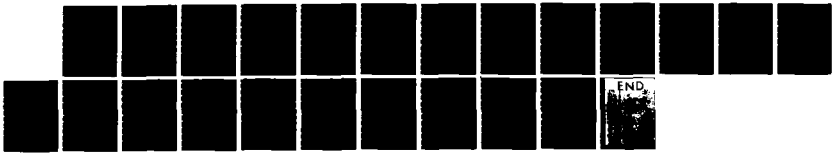

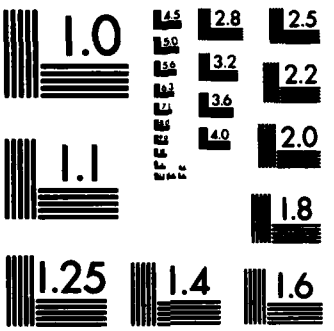

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MEDICAL ENTOMOLOGY PROJECT

ANNUAL REPORT

Oliver S. Flint, Jr.

January 1983

Supported by

U. S. ARMY MEDICAL RESEARCH AND DEVELOPMENT COMMAND
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The Medical Entomology Project (MEP), a cooperative venture between the Smithsonian Institution and the U.S. Army Medical Research and Development Command, conducts biosystematic research on arthropods of medical importance to the Army. MEP fulfills these objectives by performing biosystematic studies on important groups of vectors such as anopheline vectors of malaria parasites and culicine vectors of arboviruses, providing information on potential vectors for the guidance of military field research teams and other

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governmental agencies and preparing monographs and technical papers which summarize data on the ecology, taxonomy and medical importance of arthropod vectors in various regions of the world. In addition, MEP performs curation and research on the national collection of mosquitoes at the National Museum of Natural History (USNM), Smithsonian Institution.

Research continues on the arbovirus vector groups of the subgenus *Stegomyia*, genus *Aedes*, of the African Region.

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SUMMARY

The Medical Entomology Project (MEP), a cooperative venture between the Smithsonian Institution and the U.S. Army Medical Research and Development Command, conducts biosystematic research on arthropods of medical importance to the Army. MEP fulfills these objectives by performing biosystematic studies on important groups of vectors such as anopheline vectors of malaria parasites and culicine vectors of arboviruses, providing information on potential vectors for the guidance of military field research teams and other governmental agencies and preparing monographs and technical papers which summarize data on the ecology, taxonomy and medical importance of arthropod vectors in various regions of the world. In addition, MEP performs curation and research on the national collection of mosquitoes at the National Museum of Natural History (USNM), Smithsonian Institution.

Research continues on the arbovirus vector groups of the subgenus *Stegomyia*, genus *Aedes*, of the African Region.

INTRODUCTION

Biosystematic studies which lead to the precise identification of vectors are fundamental to any investigation of epidemiology and to the planning of control or eradication. They enable the vector or vectors to be recognized; their ecology and habits to be studied and information about vectorial capacity, resistance to insecticides, geographic distribution and so on to be passed on to other workers. Many instances of failure to control diseases resulting from vector borne pathogens can be traced to neglect of this aspect of preventive medicine research.

The Medical Entomology Project (MEP) was developed to perform biosystematic research on medically important arthropods to meet the U.S. Army Medical Research and Development Command's requirements for accurate identification of actual or potential vectors of human pathogens throughout the world. Thus, MEP is able to respond to these needs and the resources of the project are used to accomplish these requirements. This research was accomplished by 4 contract personnel, including 2 professional entomologists, plus the principal investigator and 4 professional entomologists from the Walter Reed Biosystematics Unit (WRBU) on assignment to the Smithsonian. In addition, upon request, MEP provides synoptic collections of specimens for the use of various military entomologists and assists them in biosystematic studies of medically important arthropods. This level of support may range from furnishing entomologists with keys, necessary literature, and other identification guides to the loan of specialized collecting and rearing equipment which cannot be obtained from other sources. Such support has proven invaluable to all concerned, as the Smithsonian Institution has received extremely worthwhile material from these entomologists.

REVIEW OF PROGRESS FOR THE PERIOD
1 January to December 31, 1982

1. Biosystematic Studies on Culicidae

a. Genus *Anopheles*

Subgenus *Cellia* (Leucosphyrus Group) of the Oriental region (E. L. Peyton). Studies in collaboration with the U.S. Army Medical Component, Armed Forces Research Institute of Medical Sciences (AFRIMS) Bangkok, Thailand, have continued on the revision of the Leucosphyrus Group.

Projected completion of various aspects of this study during the year were not fully realized. This was due to the unanticipated dividing of the year between two very different studies. At the special request of the Director, Walter Reed Army Institute of Research (WRAIR) and, at the invitation of the Pan American Health Organization (PAHO), this investigator participated as a temporary advisor to PAHO, in a joint multipurpose mosquito study in the remote region of Rincon del Tigre, Bolivia during the month of May 1982 as a follow-up to investigations of concurrent outbreaks of yellow fever and suspected dengue fever in Ayoreo and Chiquitano indians during 1981. This investigator provided the taxonomic support for these studies, and much of the remainder of the year was devoted to various aspects of the Bolivia study, to include the completion of a comprehensive manuscript on the taxonomic collections made in the region. Results and other details of this trip are presented below.

Work on the Leucosphyrus Group during the first part of the year, prior to involvement with the Bolivian study, concentrated on the preparation of specimens and the study of specialized mouthparts of the female and the genitalia of males and females. The cibarial and maxillary teeth of 123 females of 7 different species or forms of the Balabacensis Complex were dissected and specially mounted for study. A like number of male and female genitalia were cleared and prepared for study. The cibarial and maxillary teeth have not been thoroughly studied for the Leucosphyrus Group and until the present study the number, length and character of these structures in several species and geographic forms were unknown. Colless (1956) presented data on the cibarial and maxillary teeth found for several species or geographic forms of the Group known at that time. Although the data presented by Colless suggested possible differences between species, the sample size for some was too small (1-6 specimens) to show the range of variation that might occur within a species. The specimens prepared during the year were for the purpose of extending the sample size of some species and to compare specimens from other areas with some of those of Colless. Results show that there is a degree of overlap or similarity in the number of cibarial and maxillary teeth between some species or forms. There also appears to be a relatively narrow range of variation in the number of teeth for each species. The length and character of the cibarial teeth in some species appear distinct and may be more useful for species descrimination in some cases than the number of teeth

present. The number of cibarial and maxillary teeth found in our study sample are as follows:

Form	Number of specimens	Cibarial teeth Range (mean)	Maxillary teeth Range (mean)
An. dirus (Feral)	29	12-16(14.0)	12-15(13.2)
Perlis Form (Colony)	20	10-14(12.1)	14-16(14.9)
India Form (Colony)	13	11-15(12.5)	16-20(18.0)
Fraser's Hill Form, (Thailand) (Feral)	15	15-18(16.4)	16-20(17.6)
Kanchanaburi Form, Isoline (Colony)	10	11-14(13.1)	13-16(14.2)
Kanchanaburi Form, Feral and mixed colony, non-isoline	30	12-15(13.5)	13-17(14.7)
takasagoensis (Colony)	6	10-13(12.2)	14-16(14.6)

The above data are inconclusive since we are not yet sure of the status of some of the forms listed. The status of *dirus* and the Perlis form are no longer in question. Both have now been confirmed as distinct species by morphology, cross-mating, cytogenetics and recently, electrophoretic enzyme analysis. However, the status of the Fraser's Hill Form in Thailand remains unresolved. There is no problem with the Fraser's Hill Form from south Thailand being conspecific with that of topotypic Malayan Fraser's Hill Form. The number of cibarial and maxillary teeth presented above for the Fraser's Hill Form from Thailand compares closely with that of Colless for 6 specimens of Fraser's Hill Form from Malaya, i.e., 16-20(17.3) and 16-18(17.2) respectively. The problem lies with the form from Kanchanaburi Thailand listed above from 2 separate colonies. This form is currently viewed by my collaborators in Bangkok as conspecific with the Fraser's Hill Form in southern Thailand and elsewhere. From the above sample, the differences in number of cibarial and maxillary teeth of the Fraser's Hill Form and the Kanchanaburi Form are quite apparent. These differences in mouthparts correlate with morphological differences noted in earlier studies, in the adult, pupal and larval stages of the two forms. Based on these morphological observations, I do not neccessarily agree with the collaborators in Bangkok on the status of these two forms. At the special request of the collaborators in AFRIMS, I have again postponed publishing a description of the Fraser's Hill Form as planned. All investigators involved are in agreement that these two forms are distinct from *dirus* which occurs throughout Thailand. The AFRIMS

laboratory has a colony of the Kanchanaburi Form. Reciprocal cross-mating experiments between this form and *dirus* have demonstrated bidirectional sterility in males. However, karyotypes of the Kanchanaburi Form appear to be identical to those of the Fraser's Hill Form in south Thailand. If the completed cytogenetic and electrophoretic studies in AFRIMS confirm the two forms as conspecific, then we will have to completely re-evaluate our morphological species concepts for the Leucosphyrus Group.

During the year, 484 progeny rearings of hybrid adults with associated skins from bidirectional crosses between *dirus* and the Kanchanaburi Form were received from the AFRIMS. These specimens were examined for known significant characters of each form and it was observed that most progeny exhibited characters of the female parent. The first series of 211 adult specimens with associated skins of the Southwest Indian Form of the Balabacensis Complex were received from the AFRIMS, from the colony established in late 1981. These specimens were also examined during the year. The examination was preliminary but revealed that the species is definitely a member of the Balabacensis Complex and extremely similar to *dirus*. There appears to be a clear difference in the number of maxillary teeth in *dirus* and the Indian Form in the data presented above. There also seems to be little doubt that this form is the one reported as *balabacensis* from western India in a few earlier reports. The specific status of this form has not been decided, further studies are required.

The Perlis Form has been studied extensively at the MEP, AFRIMS and the London School of Hygiene and Tropical Medicine (LSHTM). There is no longer any doubt about this form being a distinct species. It was first recognized as a distinct species through this study on morphological and behavioral characteristics. However, the morphological differences between this form and *dirus* were noted only in the pupal stage, and the adult and larval stages of the two could not be separated. This initially led to some skepticism by a number of investigators. A study begun in 1979 on the Perlis Form, Thailand *dirus* and Sabah *balabacensis* by Jeffery Hii, Ph.D. candidate (LSHTM), was concluded in February 1982 and presented in a 253 page dissertation. The conclusions reached in this study using multivariate analysis of morphology, cross-mating and cytogenetics were in complete accord with my earlier findings based on less sophisticated morphological grounds. During the LSHTM study, many specimens were borrowed from MEP, and assistance was provided by this investigator in other ways. Dr. Hii spent 2 days at MEP discussing the Leucosphyrus Group study with MEP investigators during March 1982. The collaborators at AFRIMS and Mahidol University, Bangkok, have also confirmed these findings. A new discipline of electrophoretic enzyme analysis has been added to the study of the Leucosphyrus Group at AFRIMS. Different electrophoretic activities have been found in 3 enzymes which identify *dirus*, Perlis Form and the Fraser's Hill Form. Utilizing this new tool, the AFRIMS team has recently confirmed the presence of the Perlis Form in the south Thailand province of Phangnga. This is the first confirmation of the species in Thailand although 4 specimens, tentatively identified as Perlis Form from the southern province of Chumphon, were reported in last year's annual report. Until this year, the Perlis Form was known only from specimens of

sub-colonies of a colony established in Kuala Lumpur, Malaysia in 1967. Without feral specimens for study, the species even though recognized as distinct by all, could not be named and described. The potential for character selection in a long term established colony made the recognized specific characters highly suspect as a means of recognizing the species in the wild. The AFRIMS team made a field trip to the northeastern province of Trengganu, Malaysia in 1982 and succeeded in collecting feral specimens of the Perlis Form. A new colony has been established at AFRIMS from this material. Thirty feral adults and 65 slides of pupal and larval skins and whole larvae of the Perlis Form from this trip were received and examined in the later part of the year. As expected, the morphological characters in the feral material were not as consistent or uniform as those studied earlier in colony material. There is considerably more variation in the feral material and some characters thought to be of potential value in separating the species from *dirus* using colony specimens show complete overlap with those of *dirus*. Now that feral material of the Perlis Form is available for study and comparison with material from various colonies used in earlier studies, we will now proceed with the formal description and naming of the species.

In addition to the above, 342 adults and 443 slides of immature stages of the Fraser's Hill Form from various parts of Thailand were recieved for study. Examination of this material was not completed. Some work was also accomplished on the study and description of a new species from Sumatra, Indonesia.

The Bolivia trip involved the collection of adults for virus isolation studies and the collection and rearing of the immatures to the adult stage for taxonomic studies. Twenty-nine were spent in country with 19 days spent on site in the Rincon del Tigre area. Participants in this study included representatives of the WRAIR, PAHO, Bolivian Ministry of Health and the Centro Nacional de Enfermedades Tropicales, Santa Cruz, Bolivia. Approximately 7000 adult mosquitoes were collected and frozen for virus isolation studies. This investigator spent considerable time at the WRAIR assisting in the identification and pooling of these specimens after the trip was completed. Specimens collected for taxonomic purposes included 446 males, 817 females, 824 with associated pupal and/or larval skins, and 512 whole larvae. The larvae and pupae were all mounted on slides at MEP, and many special preparations of male terminalia were made. All specimens from Bolivia were then identified to species. A total of 58 species belonging to 14 genera were identified from this material. Of the 58 species collected, 8 were new records for the country and 2 were undescribed species. The undescribed larval and/or pupal stages of at least 7 known species were also collected. A 45 page manuscript on the taxonomic mosquito collections made in Bolivia was completed by this investigator and an abstract was submitted to the American Mosquito Control Association for presentation in a symposium at the annual meetings in Orlando, Florida, in February 1983.

Other activities during the year included the review of 6 manuscripts written by others for publication.

b. Genus *Aedes*

Basic to all studies on mosquitoes and to the control of mosquito-borne diseases is a determination of the exact species involved. A detailed knowledge of all the life stages and both sexes is usually essential to determine the species. Thus, taxonomic studies should be based on some reared material with their associated larval and pupal skins. This type of material can only be obtained from individual rearings of field collected larvae or eggs or through rearings of progenies from wild females. There is at present very little of this type of material available anywhere for the African fauna. Thus, efforts in the past year were primarily directed toward field work and developing contacts in more countries for work where the need is greatest for such critical material.

A very successful field trip was made to the Institut Pasteur, Dakar, Senegal between May 23 and June 14, 1982. The trip had 2 primary purposes, first to study the material available of African *Stegomyia*, especially the Africanus Subgroup, and second to discuss with Dr. M. Cornet, Office de la Recherche Scientifique et Technique Outre-mer (ORSTOM), the possibilities for future collaborative arrangements involving field work in west Africa.

The extensive collections at the Dakar laboratory which were made primarily in Cameroon, Gambia, Guinea, Upper Volta and Senegal, were carefully studied, identified, and the data recorded. Primary emphasis was placed on examples from the Africanus Subgroup as they are important vectors of Yellow Fever, Rift Valley Fever, Chickungunya and Zika viruses.

Currently, the Africanus Subgroup of *Aedes (Stegomyia)* consists of two species complexes known as the Africanus and Luteocephalus Complexes. Presently there are 4 species in the Africanus Complex (*africanus, neoafricanus, pseudoafricanus,* and *opok)*, and 2 species in the Luteocephalus Complex (*luteocephalus* and *ruwenzori*). However, this study of the material at the Dakar laboratory found at least 2 new species confused with *africanus* and 2 or 3 misidentified under *luteocephalus*. A total 190 of the most important specimens were selected for loan and hand-carried back to the Smithsonian for further study.

In addition, 75 specimens of the Simpsoni Complex from Kedougou, Senegal were selected, pinned and labelled. These specimens were obtained from eggs collected by scraping tree holes during the dry season in February and then reared at the Dakar laboratory in May.

The material studied at the Dakar laboratory was obtained primarily by Drs. Germain and Cornet, ORSTOM, due to their interest in the systematics of disease vectors. While there, Dr. Cornet told me that in Senegal both yellow fever and dengue-2 viruses have been isolated from *Aedes luteocephalus* females biting man in the Kedougou area. He also found dengue-2 virus in a wild caught monkey from Kedougou. Dengue-2 virus has also been isolated from *africanus* and *luteocephalus* in Guinea and Upper Volta, and from *africanus* in Ivory Coast, all from females biting man.

One very important adjunct to the visit was teaching entomologists at the Dakar Laboratory in the identification of African *Stegomyia*, particularly members of the Africanus, Luteocephalus and Simpsoni Complexes. As a result of this effort we have received from this laboratory one lot of eggs of *Aedes (Diceromyia) furcifer* and 5 lots of eggs of *Aedes (Stegomyia)* from Senegal. These have been reared in our laboratory at the MEP. From these we obtained a total of 225 adults, 216 larval and 211 pupal skins, and 6 larvae.

A detailed study of the Africanus Subgroup is underway. A preliminary examination and sorting of all available material of the Subgroup has been completed. A total of 561 adult specimens were examined and 125 male and female genitalia slides were prepared during the year. Ten species have been recognized in these collections, four of which are undescribed. The new species will be fully described and figured as soon as possible. However, much more material from both East and West Africa will be needed before final decisions and a revision of Subgroup can be made.

Considerable time was devoted to preparation for a combined African Museum and field collecting trip in the early part of 1983. The objectives of this trip are: (1) to complete the examination of important material of African *Stegomyia* at the Division of Vector-Borne Diseases (DVBD), Nairobi, Kenya and to conduct a short training course on "Yellow Fever Vectors in Africa" for the DVBD staff, and (2) to undertake field studies in Kenya (Nairobi, Mombasa, Malindi, Lamu) collecting and individually rearing of topotypic and other critical material, obtaining biological and ecological information with primary emphasis on the Simpsoni and Africanus Complexes.

In conjunction with the Kenya trip, a stop is planned in Cameroon. An invitation was received from Dr. J.P. Adam, ORSTOM, at Centre Pasteur, Yaounde, Cameroon, to visit and collect there. This portion of the trip is designed to: (1) further pursue field studies of the *Stegomyia* species and especially the Africanus Complex and (2) to develop arrangements for further extensive field work in Cameroon in conjunction with ORSTOM during the coming year.

Reviewed 5 manuscripts and 1 proposal written by others during the year.

c. Work of associated personnel (Walter Reed Biosystematics Unit)

Dr. R.E. Harbach has begun studies on *Culex*, subgenus *Culex* from northern Africa and southeastern Asia. Currently, there are about 25 species (with 75 names) recognized in the region. In order to study the types and other critical material of this group, he completed a successful trip to the major museums in London and Paris this year.

Dr. B.A. Harrison has a number of mosquito projects underway in addition to the cooperative work on the *Anopheles* (Leucosphyrus Group) as reported by E.L. Peyton. A major project involves the completion of the revision of the Kochi Group (*Aedes*, subgenus *Finlaya*), which consists of 11 species in SE Asia (jointly with R. Rattanarithikul). Other work on Asian mosquitoes involves new records and biological notes on Thai mosquitoes and the description of a new species in the Chrysolineatus Group of *Finlaya*. Further Anopheline

studies from SE Asia are concerned with the cytogenetics of the Maculatus Complex, and hybridization work between *philippinensis* and *nivipes*. A second region of interest involves Egypt and northern Africa where the Aedes Caspius Complex is under revision and a pictorial key to the species of *Anopheles* is being prepared.

Dr. K.J. Linthicum completed the final draft of his revision of the Argyritarsis Section of the genus *Anopheles (Nyssorhynchus)* from the New World. The work has been reviewed by one person and is currently under critical review by the second. After the completion of the reviews, it will need final revision and typing before submission for publication.

The neotropical genus *Trichoprosopon* was recently divided into 4 genera by Dr. T.J. Zavortink. He is currently continuing a revisionary study on three of these genera that contain just under 50 species, a third of which are undescribed. The revisions will contain description of males and females as well as larvae and pupae of most species.

2. Curatorial Activities

a. Status of World Collection of Culicidae

The year was a productive one in terms of material added to the mosquito collection (please see appendix 1). Large collections resulting from rearing and hybridization studies of Southeast Asian *Anopheles* were received from the AFRIMS Laboratory in Bangkok, Thailand. Many accessions were made from the Walter Reed Army Institute of Research, two of which were of special importance. One resulted from the field work in Bolivia by E.L. Peyton and D.R. Roberts and resulted in nearly three thousand specimens. These are mostly reared material and will be very valuable as the basic reference collection in relation to arbovirus studies currently being conducted by the WRAIR in the region. This field trip is fully reported under section 1a. of this report. The second major collection of several thousand specimens resulted in the transfer of a collection from the Chincoteague Island facility of mostly local, partially reared material. It has added useful material of a number of species poorly represented in the MEP collection.

The slides of the world collection were reorganized by genus, subgenus and species, in preparation for the amalgamation of this collection with the Southeast Asian collection already organized in this manner. An inventory was made of all the drawers and slide boxes of mosquitoes in the collection, in preparation for the eventual transfer to the Smithsonian's Silver Hill facility.

b. Accessions and Other Activities of the MEP Collections Management Section

The 73 accessions received in MEP are summarized in Table 1. Incoming lots amounted to 23,225 items, an unusually large number for any year. Twelve of the 25 outgoing shipments involved specimens totalling 540 individuals.

This is much smaller than the previous years total, but was expected. As in 1981 a major effort was made to return all old outstanding loans.

A teaching collection of mosquitoes of medial importance from many areas of the world was selected from duplicate material in the collection. This was sent to the South Carolina Center for Public Health, for training students in a Tropical Medicine and Public Health curriculum.

3. Other Activities

a. Identification Services

In keeping with the stated duties at MEP, the staff made identifications of various lots of material from outside sources. Dr. Huang identified a series of *Aedes (Stegomyia)* from Anguilla, West Indies for Dr. A.B. Knudsen, PAHO/WHO. A large collection of *Stegomyia* specimens from Kedougou, Senegal were identified for Dr. M. Cornet, ORSTOM. She also verified the correctness of mosquito names for COL Carestia, WRAMC and Dr. L. Knutson, USDA. Mr. Peyton identified approximately 150 specimens of mosquitoes submitted from outside sources from the following countries: Bolivia, Guatemala, Guyana, and Peru.

b. Publications

A number of draft manuscripts by staff were completed but none were published during the year.

c. Illustrations

The only scientific illustrator on the MEP staff was only able to work through the first six months of 1982 because of lack of funding during the second half year. During these six months he prepared a series of maps showing the distributions of a number of North African mosquito species for the WRBU staff. Most of his time was spent in preparing illustrations (adult male terminalia and larval and pupal structures) of the genus *Aedes*. These included 5 plates for the description of the new subgenus *Belkinius* and worked in the subgenus *Paraedes* for J.F. Reinert, as well as larval, pupal, and male terminalia plates for Huang's work on African *Stegomyia*. Considerable time early in the year was spent making corrections to the plates for K.J. Linthicum's study of South American *Anopheles (Nyssorhynchus)*.

d. Scientific Literature

The filing of the extensive collection of reprints from Dr. Belkin and others was completed during the year. Many new folders were prepared and integrated with the old. The entire collection was filed and expanded into new cabinets. The collection of books was indexed and arranged on new shelving. Thus, the already outstanding literature collection is ever enlarged and made more accessible.

e. Attendance at Scientific Meetings

Mr. E.L. Peyton attended the annual meetings of the Gorgas Memorial Institute in Washington, D.C.

f. Visitors

During the year, 33 visitors signed the guest book in the project. The overseas visitors were: Jeffrey Hii Lu-Kim (London School of Hygiene and Tropical Medicine, London), Xu Jin-Jiang (Inst. Parasitic Diseases, Academy of Medical Sciences, Shanghai), Jeffrey Hii (Dept. Med. Services, Malaria Cont. Prog. Sabah, Malaysia), Maureen Coetzee (National Institute for Tropical Diseases, Tzaneen, South Africa), Hari R. Bhat (National Institute of Virology, Pune, India), Sixto Coscaron (Facultad de Ciencias Naturales y Museo, Universidad La Plata, Argentina), K. Mendis (Dept. Parasitology, Faculty of Medicine, Colombo, Sri Lanka), Peter S. Cranston (Dept. Entomology British Museum Natural History, London), D. Chadee (Insect Vector Control Div., Port of Spain, Trinidad), J. Mouchet, Office de la Recherche Scientifi et Technique Outre-Mer., Bondy, France), Joel Margalit (Ben Gurion Univ. Beer Sheba, Israel)), Adel Gad and Sherif El Said (Research and Training Center on Vectors of Disease, Ain Sham University, Cairo, Egypt), NRH Burgess (Royal Army Medical College, London).

g. Consultants

The consultants of the MEP are identified in Appendix 2.

Dr. Kenneth L. Knight has continued the taxonomic study of the *Aedes (Finlaya)*, Niveus Complex, on a part-time basis. The Complex includes a number of known vectors of human disease. Currently he recognizes about 26 species in this complex, of which several are unnamed. The complex occurs from Korea and Japan south to Java and Palau, and west to India and Sri Lanka, with the largest number of species known from Thailand and Malaysia.

The taxonomy of this group is extremely difficult, because the work must be based on museum specimens only, several species show small geographical variations, and the only reliable specific differences are found in the male genitalia. In an attempt to minimize some of these problems he has undertaken his studies based on discrete geographical areas. To start with, he is working on the Malaysian fauna, one of the more complex areas. His plan is to produce accurate and workable keys along with synoptic descriptions of all the life stages, so far as they are available, and illustrations of these life stages when appropriate.

All consultants have continued to give freely of their time, reviewing manuscripts, answering questions, and generally supporting the work of MEP. We are indebted to them all.

h. Mosquito Information Management Project

This independent project, directed by Dr. T.L. Erwin, Smithsonian Institution and Dr. B.A. Harrison, WRBU, relys heavily on the records stored in MEP for its work. During the past year, 2947 collection records pertaining to specimens in Mexico and Central America, South America and Eastern Africa were incorporated into the data base. Collection records for several small accession (16), two collections from Kenya (180), and part of one collection pertaining to the genus *Trichoprosopon* were submitted to the computer.

Computer digitized maps (from Bolivia, El Salvador, Western Europe, Northern Africa, Panama) were produced from the computer program World Data Bank II. The map of Panama included computer-plotted distribution points of mosquitoes. Communications between the NBI Word Processor and the SI Honeywell computer, in addition to potentially many other computer terminals, were established which allow data retrieval and format manipulation.

Appendix 1

TRANSACTIONS OF THE MEDICAL ENTOMOLOGY PROJECT, 1982
(Accessions, loans, returned loans, etc.)

SOURCE (INCOMING)	NO.TRANS.	ADULTS	SLIDES	OTHER
AFRIMS Bangkok, Thailand	10	4835	3825	-
WRAIR, Washington, DC	15	5429	-	2267 vials of immatures 50 unmounted adults 112 lots of unmounted immatures 2 egg collections
P. Jupp Institute of Virology South Africa	2	592	-	597 vials of immatures 35 gravid females
P.S. Cranston British Museum London, England	5	1348	201	-
R. Baker University of Maryland	2	66	-	123 vials of immatures 232 lots of unmounted immatures
M. Cornet, ORSTOM Senegal	3	176	-	38 lots of unmounted immatures 22 egg collections
A. Spielman Harvard School of Public Health	1	-	-	10 vials of immatures 18 unmounted adults
E. Rubio Universidad Del Zulia Venezuela	1	1	-	-
T.J. Zavortink Univ. of San Francisco	2	-	-	19 vials of immatures 34 lots of unmounted immatures

SOURCE (INCOMING)	NO.TRANS.	ADULTS	SLIDES	OTHER
J. Hayes Texas Tech. University	1	67	-	-
M.F. Suarez, Servicio Nacional de Erradicacion de la Malaria, Colombia	1	12		218 vials of immatures
J.P. Duret, Argentina	1	77	7	-
P. Arnaud, California Academy of Sciences	1	8	-	-
G. Davidson, London School of Hygiene and Tropical Medicine	1	292	55	-
H.R. Acuna, Pan Am Health Organization, Trinidad	1	-	3	8 vials of immatures 1 egg collection 5 lots of unmounted immatures 5 lots of unmounted adults
D. Theron, National Institute of Tropical Disease, Republic of South Africa	1	243	135	-
N.L. Evanhuis Bernice P. Bishop Museum Hawaii	1	1	2	-
R.B. Kinsey University of California at Davis	1	17	-	-
D.J. Pletsch Mexico	1	16	-	-
W.L. Jacob, CDC Ft. Collins, Colorado	2	19	8	83 unmounted adults
F. Rodhain Institut' Pasteur Paris	1	-	19	-
D.D. Pinkovsky Brooks AFB, Texas	1	-	-	6 unmounted adults

SOURCE (INCOMING)	NO.TRANS.	ADULTS	SLIDES	OTHER
R.F. Darsie CDC, Atlanta	1	181	84	-
Fort Meade Florida Department of Agriculture	1	-	290	-
J. Callot Institute Pasteur Strasbourg, France	1	-	1	-
J.H. Zimmerman NAMRU 3	1	13	15	7 vials of immatures 30 lots of unmounted immatures
USNM Washington, DC	1	2	-	-
A. Friedberg Tel Aviv University	1	251	-	-
E. Walker Univ. of Massachussets	1	1	-	-
A. Rickenback, ORSTOM Bondy, France	1	38	-	-
J.P. Cornet, ORSTOM Republique Centrafricaine	1	435	-	-
Institute Pasteur Paris, France	1	151	290	-
Musee De Historie Naturelle, Paris France	1	-	2	-
J. Ledger South African Institute of Medical Research	1	10	10	-
T.J. Givnish Harvard University	1	-	-	32 lots of unmounted immatures

SOURCE (INCOMING)	NO.TRANS.	ADULTS	SLIDES	OTHER
D.D. Chadee Ministry of Health Trinidad	1	-	-	2 unmounted adults
I. Rambajan Ministry of Health Guyana	1	23	-	-
A.M. Young Milwaukee Public Museum Milwaukee, Wisconsin	1	-	-	2 unmounted adults
USDA Beltsville, Maryland	2	-	-	16 unmounted adults

SUMMARY OF TRANSACTIONS FROM 1 JAN 1982 TO 31 DEC 1982

SOURCE	NO.TRANS.	ADULTS	SLIDES	OTHER
INCOMING (TRANS. NO. 886-972)	73	14,304	4,947	3249 vials of immatures 483 lots of unmounted immatures 5 lots of unmounted adults 25 egg collections 177 unmounted adults 35 gravid females
OUTGOING	14	261	273	6 vials of immatures

Appendix 2

MEDICAL ENTOMOLOGY PROJECT CONSULTANTS

MAJ Richard G. Andre, Department of Medical Entomology, U. S. Army Component, Armed Forces Research Institute of Medical Sciences, APO San Francisco, California 96346 - Malaria vectors.

Dr. Pedro Galindo, Gorgas Memorial Laboratory, P.O. Box 935, APO Miami, Florida 34002 - New World Culicidae.

CPT Jayson I. Glick, U.S.A. Medical Research Institute of Infectious Diseases, Fort Detrick, Maryland 21701 - African Ceratopogonidae.

Dr. J. M. Klein, Centre O.R.S.T.O.M. de Papeete, B.P. 529, Papeete, Tahiti - Oriental Culicidae.

Professor Kenneth L. Knight, North Carolina State University, Raleigh, North Carolina 27650 - *Aedes (Finlaya)*.

Dr. Peter F. Mattingly, Sussex, England - African Culicidae and *Tripteroides*.

Dr. Botha de Meillon, Philadelphia, Pennsylvania - African Culicidae and Ceratopogonidae.

Mr. J. Mouchet, O.R.S.T.O.M., Bondy, France - Culicidae.

Dr. Shivaji Ramalingam, University of Malaya, Kuala Lumpur, Malaysia - *Topomyia, Malaya, Armigeres* and Malaysian Culicidae.

LTC John F. Reinert, Research Liaison Officer, Armed Forces Pest Management Board, Gainesville, Florida 32604 - Genus *Aedes*.

Dr. John E. Scanlon, School of Public Health, University of Texas, Houston, Texas 78284 - Culicidae.

Dr. Graham B. White, London School of Hygiene and Tropical Medicine, London, England - African Culicidae.

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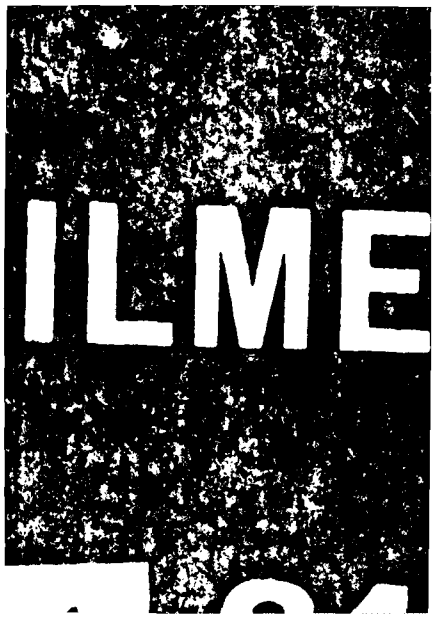
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